IMPROVEMENTS RELATING TO CAMERA SYSTEMS

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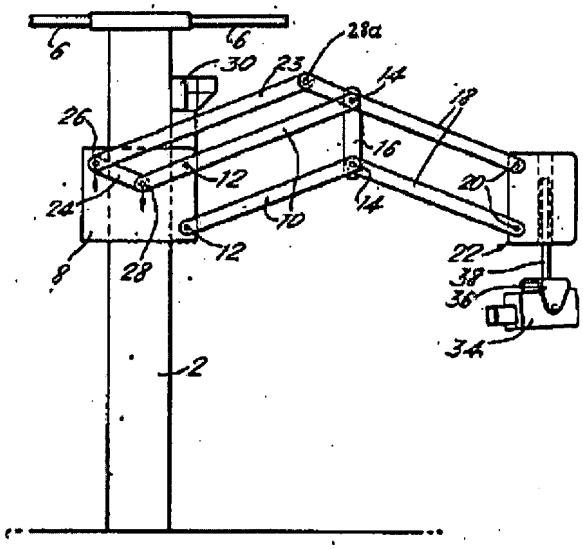
Abstract of **GB1240837**

1,240,837. Camera support system. RANK ORGANISATION Ltd. 14 May, 1969 [16 May, 1968], No. 23341/68. Heading F4R. [Also in Division G2] Parallelogram linkages 10 and 18 are mounted on a platform 8 to allow a camera 34 or other equipment, e.g. studio lights, to be moved in the common vertical plane or rotated about a support pillar 2. The weight of the system is counterbalanced by applying forces to the additional linkage 23, 24 at suitable points such as indicated by the arrows, the forces being gravitational, pneumatic or hydraulic. The driving actuators of the system (not shown) are controlled by the operator in the cabin 30. The pillar may be strapped to the wall or roof of a studio by strut 6, and cables may be led from the wall or roof to the camera via the units 10 and 18 and a slip ring system (not shown). The linkages 10, 18 may be indirectly connected via an intermediate member (not shown).



PATENT SPECIFICATION

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DRAWINGS ATTACHED

1 240 837

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(54) IMPROVEMENTS RELATING TO CAMERA SYSTEMS

(71) We, THE RANK ORGANISATION LIMITED, of Millbank Tower, Millbank, London, S.W.1, a British Company, (formerly of 11 Belgrave Road, London, S.W1), do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to means for supporting studio equipment, for example, cameras.

For movement within a studio, cameras are frequently mounted on support mechanisms which are vehicles. These vehicles inevitably occupy a substantial floor area and require a substantial width of passageway when moving between stations on the studio floor. Since the studio floor is inevitably extremely crowded, the space available for sets and for actors is reduced because of the working space which is occupied by the cameras, support vehicles, microphone boom vehicle, and a multiplicity of large cables. In addition, these cables are both expensive and vulnerable, and considerable risk of damage exists as a result of support vehicle movement.

It is an object of the present invention to be able to position a camera wherever required in the studio so that it can be displaced and rotated by means which occupy, at most, a minute floor area, provide for clearing many of the cables from the floor and also protect these cables from damage.

According to the present invention, supporting means for cameras or other studio equipment comprises a vertical supporting column, a platform vertically adjustable and horizontally rotatable about said column, a parallel motion linkage, one end of which is pivoted to the platform and the other end of which is arranged to be loaded by suspending the equipment therefrom, said linkage comprising two parallelogram linkage units.

The camera can be mounted by any suitable mount directly at the free end of the outer linkage. However, should it be desirable to extend the reach of the support system of the invention, the camera may alternatively be indirectly mounted upon the free end of the outer unit, either by way of one or more further linkage units of the same type, or by way of any other suitable extension piece.

Suitably the two linkage units are directly coupled together by using common pivots at their adjacent ends. With this arrangement both units can pivot together about the vertical axis. Alternatively the adjacent ends of the units are spaced apart and are separately pivotally mounted to an intermediate support member. By selecting the length of this intermediate support member, the reach of the support system can further be extended.

Preferably, the vertical supporting column is a mast, which may be suitably supported at its base upon the studio floor or may, in addition be braced at its upper end by being attached to a lighting grid, studio wall or other permanent structure. In this case the cabling from the camera may be led along the linkage units to the mast, from which it is led upwardly to a high level and thence to associated rack equipment. By this means the presence of the cables upon the studio floor, where they cause considerable obstruction and are subject to damage, is avoided.

In a preferred embodiment of the invention counterbalance is most conveniently achieved by providing counterbalance extensions for at least one of the arms of that linkage unit nearest the load, i.e., the outer unit, and for at least one of the arms of that linkage nearest the vertical rotation axis, i.e.,

the inner, or first, linkage unit. By the use of such an arrangement, the arcuate length of travel of the extended ends of the arms, and of the means providing loading of these extended ends, also is reduced to a minimum. Suitably, the loading producing counterbalance is by weights, or spring or pneumatic or hydraulic pressure.

Conveniently, more than one camera may be mounted with their co-operating support systems upon a single mast. Each camera may be so mounted that it can rotate about a vertical axis through an angle greater than 360°. The camera may, in addition, be mounted for continuous rotation in either direction; in this case, however, suitable means, for example a slip ring system, must be employed to carry cabling to the camera from the associated equipment.

An embodiment of the invention will now be particularly described by way of example with reference to the accompanying drawing which is a schematic representation of a camera support system.

Referring to the drawing, the camera support system comprises a relatively massive support pillar 2 which extends vertically between the studio floor and a region adjacent the studio roof. At the roof region, the upper end of the pillar 2 is braced to the studio wall by way of horizontal struts 6. The struts are arranged not only to prevent lateral movement of the pillar but also to prevent torsional movement as a result of rotation of any components, for example the camera support system of the invention mounted on the pillar. The pillar preferably is designed to enable it to be moved to different stations on the studio floor.

Firmly secured to the pillar 2 is a platform 8 the height of which can be adjusted but which is not in this embodiment continuously variable as an operating parameter. The platform is however mounted to rotate around the pillar 2 in either direction on demand by way of any suitable actuating means well known in the art.

Two rectilinear arms 10 of equal length comprising a first linkage unit are attached, at one end, to the platform 8 by way of vertically spaced pivots 12 permitting angular rotation about a horizontal axis. The opposite ends of the arms 10 again are mounted upon pivots 14 which are similarly spaced apart on a tie member 16, so that the arms 10 with pivots 12 and 14 and member 16 constitute a parallelogram linkage.

Also directly secured to the pivots 14 is a second linkage unit comprising two further arms 18, on which is mounted at pivots 20 a camera support mechanism indicated generally at 22. Pivots 14 and 20 together with the common member 16 and the arms 18 again form a parallelogram linkage.

Suitable actuators, well known in the art and not shown in the drawing, are arranged independently to move the first, or inner, linkage unit comprising the arms 10 relatively to the platform 8 about the pivots 12. Further actuators, again not shown in the drawing, are arranged independently to move the second linkage unit comprising the arms 18 relatively to the first linkage unit and about the pivots 14.

In the embodiment shown, with the arms 10 and 18 of equal length, radial horizontal movement only of the platform 22 will be produced when the two linkage units are moved through the same angle but in opposite directions. However, to produce vertical in addition to horizontal movement, the linkage units are moved through different angles, the extent of the vertical movement being determined by the difference between the angular movment of the two linkage units. Moreover, as a result of the linkage configuration and the pivots 20, the orientation of the platform 22, remains constant irrespective of vertical or horizontal movement.

In order to reduce the forces which are required to maintain the camera support system in a stationary or in a constant velocity condition, any suitable counterbalance system may be employed. In this embodiment, the two upper arms 18 and 10 of the respective linkages are extended beyond the co-operating pivots 14 and 12 and are pivotally linked, at the free ends of these extensions, by way of two further arms 23 and 24 which are joined at a pivot 26 and which are connected to the extensions of arms 10 and 18 at further pivots 28 and 28*a*. The pivot points 26 and 28 are suitably urged to an extent adequate to produce counterbalance by forces in a direction indicated by the arrows, for example by weights, springs and the like. Alternatively, a single loading point intermediate the pivots 26 and 28 may be used.

The camera operator(s) is/are situated in a cabin 30 near to the platform 8, from which cabin the camera is clearly visible.

The operator demand signals for producing camera movement preferably are signals representative of a change of camera height, horizontal reach and rotation with respect to the pillar. These demand signals, with the possible exception of the rotation signal, must be correctly processed in order to provide drive signals to the actuators which produce only angular movement of the linkages and are disposed at the linkage elbows.

In an alternative embodiment of the invention, the demand signals produced by the camera operator in the cabin 30 are moreover made directly representative of the required change in camera, rotation, height and horizontal reach. The ratios between the demand signals and the actuator movements, to produce the desired camera

movement, are selected to take into account the velocity ratio introduced by the linkage configuration.

The camera 34 is pivotally supported on a trunnion 36 which is, in turn, supported upon a shaft 38 of length sufficient to give the camera a vertical excursion of up to some few feet independently of any movement of the linkage units. The shaft may be again moved relatively to the support 20 by any suitable means well known in the art, for example a rack and pinion movement.

The advantages of the system described enable a camera and operator to be supported with, at worst, an extremely small studio floor being occupied. In addition, cables from the camera can be so disposed as not to obstruct the floor and thereby become damaged by studio equipment. Given a suitable control system, it also becomes possible for one man, unaided, adequately to perform the functions of positioning, focusing, zooming and panning the camera without excessive difficulty.

An advantage of the multilinkage units above described for supporting the camera is the small relative velocity that are generated between moving parts when the camera position is changed; hence the noise and wear problems are minimised.

Additional studio equipment, for example microphones, lights and the like can also be supported either from any suitable point in the system described or from an alternative but substantially identical system of lighter construction.

WHAT WE CLAIM IS:—

1. Supporting means for cameras or other studio equipment comprising a vertical supporting column, a platform vertically adjustable and horizontally rotatable about said column, a parallel motion linkage one end of which is pivoted to the platform and the other end of which is arranged to be loaded by suspending the equipment therefrom, said linkage comprising two parallelogram linkage units contained substantially in a vertical plane containing or parallel to the column axis, and pivotally interconnected in a vertical plane radially between the column and the load suspension point in such a manner that said linkage allows both horizontal radial movement and vertical movement of the load with respect to the platform, wherein said linkage has counterbalancing means connected to it whereby counterbalance forces may be applied to the linkage to assist in maintaining the system including the suspended load in a stationary or constant velocity condition.

2. Supporting means as claimed in claim 1, wherein the first or inner linkage unit has a pair of parallel arms which are equal in length to a pair of parallel arms of the outer or second linkage unit, said pairs being interconnected by at least one vertical link.

3. Supporting means as claimed in claim 2, wherein the counterbalancing means comprises an extension of at least one of the arms of the outer linkage beyond a horizontal pivot axis at which it is connected to the inner linkage and an extension of at least one arm of the inner linkage beyond a horizontal pivot axis at which it is connected to the platform, and means for loading said extensions.

4. Supporting means as claimed in claim 3, wherein the two extensions are interconnected by a third linkage unit, to which the counterbalance force is applied.

5. Supporting means as claimed in claim 4, wherein the counterbalance force is distributed at at least two connection points of the third linkage unit.

6. Supporting means as claimed in claim 4, wherein the counterbalance force is applied at an intermediate point of the third linkage unit.

7. Supporting means as claimed in any one of claims 3 to 6, wherein the counterbalance force is at least partly spring force.

8. Supporting means as claimed in any one of claims 3 to 6, wherein the counterbalance force is at least partly pneumatic or hydraulic.

9. Supporting means as claimed in any one of claims 5 to 8, wherein the counterbalance force is produced at least partly by weights.

10. Supporting means as claimed in any one preceding claim, arranged to allow rotation through more than 360° about the relatively fixed vertical axis of the supporting column.

11. Supporting means as claimed in any one preceding claim including a slip ring system for connecting electrical cables to the equipment whilst performing the rotation about the relatively fixed vertical axis.

12. Supporting means as claimed in any preceding claim, including means for bracing the upper part of the supporting column to the studio wall at or near the roof region.

13. Supporting means for studio equipment substantially as hereinbefore described with reference to the accompanying drawings.

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Agent for the Applicants.

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1240837 COMPLETE SPECIFICATION
1 SHEET *This drawing is a reproduction of the Original on a reduced scale*